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over with large square and irregularly formed spots, of a yellowish-brown or fawn colour, divided from each other by a narrow stripe of the pale ground colour, and represented among the antelopes by the appearance of the *Tragelaphus scripta*, and one or two others. The head is adorned with three prolongations of the bone, two of which, in the usual place of horns, are generally described as such. They are covered with a velvety skin similar to those of the deciduous horned deer at their first growth, but which does not fall off, and at the tip they are surmounted by some strong bristly hairs. In the adult, the internal structure is hard and solid; but in the young, Geoffroy St. Hilaire observed the appearance of a cellular centre, nourished by vessels. The third protuberance is in the centre of the skull, and appears as a rounded knob, and is of a very spongy texture. The cameleopard was seen by Denham and Clapperton in parties of five or six on the borders of Lake Tchad, and also met with and described by Ruppel in his Travels in North Africa; while those of the south are frequently mentioned in the Travels of Le Vaillant and Burchell.

" In a state of nature they are timorous, and flee immediately from danger, but in a state of domestication lose a great part of their timidity, become mild and docile, know their keeper, and take from the hand what is offered to them."

We may here passingly observe, that a very fine specimen of this singularly shaped animal may be seen in the Musuem of Trinity College, Dublin.

We are sorry to observe, that while the Plates in the present volume are superior to those in most of the preceding, there is a sad falling off in the letter-press department—we have seldom seen a more slovenly printed book.

ON THE CONSTRUCTION OF RAIL-ROADS.

As the subject of railroads through Ireland is one in which all must feel interested, we give the following discussion between two eminent individuals, relative to the proper construction of the various kinds of roads which may be required on a line;—

Dr. Lardner commenced by saying, that on account of the commercial and political consequences resulting from the formation of rail-roads, many questions with reference to them became important, although, considered in an isolated point of view, they might appear trifling. He had before stated, in his lecture at the Rotunda, that the perfection of a rail-road would be, to have it entirely and unqualifiedly level. If they wished to connect two points in a country by a rail-road, to do it in a perfect manner, a straight line ought to be drawn from one extremity to the other, and this line should be perfectly level. This state of perfection was not, however, attainable, and they were then obliged to consider with all due care, and take a balance of the advantages which any proposed line offered. He proposed to call the attention of the Section to the effects of declivities and curves upon a rail-road. Having been called some time ago before a committee of the House of Lords, to give evidence respecting two intended rival rail-roads, this led to an inquiry, the result of which at the moment startled him; but this soon vanished, and he only felt astonished at his own stupidity. Every road offers a sensible resistance to traction, but this on a rail-road is less, because the surface is more uniform. The resistance on a rail-road to the power of traction is always the same as the resistance produced by ascending an acclivity rising 1 foot in 250—that is, supposing the rail-road to be level. Suppose a rail-road rising 1 foot in 250, the resistance to traction then proceeds from two causes—the resistance on the level, as already explained, and the resistance offered from the actual acclivity. The resistance to be overcome on the level is equivalent to nine pounds per ton, and on the road ascending 1 foot in 250, it would be eighteen pounds per ton; and thus it is seen, that in the latter case the drawing power must exert twice the force necessary on the level. If the road rose 2 feet in 250, the drawing force would be twenty-seven pounds to the ton. This view of the subject is confined to ascents; but it should not be forgotten, that when a rail-road is worked, the transit is from one end to the other. It was necessary, in estimating the merits of rail-roads, to consider their action downwards as well as upwards. In coming down a steep, no force is required to impel an engine, and the gravity restores that force in going down which it has robbed from it in the ascent. You had to provide, in an ascent of 1 foot in 250, for a resistance of eighteen pounds to a ton, but descending, no force was required. If it was desired to strike an average between the ascent and descent, the road would present a surface which would be equivalent to a level. This point, respecting ascent and descent, struck the House of Lords as a paradox, but it was one only in sound and not in reality. He remarked that these observations referred to ascents not more steep than 1 foot in 250; but supposing the rise to be 3 feet in 250, and where the strain would be, consequently thirty-six pounds in each ton—would gravity give this back in the descent? It was true that no power was required in descending; but while only nine pounds were gained in the descent, twenty-seven pounds were lost in the ascent. Beside the loss of power, there was also the danger resulting from the too great velocity occasioned by sudden descents. In one of the lines of railway for which a bill had been applied for to the House of Lords, there was a slope of 1 foot in 106 in a descent of two miles and a half long, and the velocity given to an engine on arriving at the foot of the slope could not amount to less than 70 miles an hour. To mitigate defects arising from these abrupt descents, breaks were applied, but not always with success. The break is a piece of wood, pressed against the tire of the wheel by a lever, and if it acts with full effect it ought to prevent acceleration. He had seen several cases in which it had totally failed, and one instance which occurred he would detail. At one of the slopes between Manchester and Liverpool, he was descending with a loaded train of one hundred and fifty tons. The operative engineer, whether through a desire of displaying the rapidity of the engine's movements, or through neglect, did not apply the break at the commencement of the slope. When half way down, the velocity became so great, that he (Dr. Lardner) requested the breaks to be applied, but on doing so they were instantly burned. The train went down at a tremendous speed, although the supply of steam had been cut off. When the train had been stopped, it was found that the wheels of one of the waggons which revolved with the axis had been broken, and yet notwithstanding this accidental drag, the speed amounted to about fifty miles an hour. It was objectionable to have any slope exceeding one foot in two hundred and fifty, for when the excessive natural powers of gravitation were resorted to, control over its movements was impossible. The conclusion to be arrived at, although it appears paradoxical, is, that you may construct two rail-roads, say of one hundred miles in length, one level, the other going over mountains, and yet the two rail-roads may be worked by the same mechanical power. Suppose in the one you ascend one foot in two hundred and fifty, and descend in the same ratio, a pull of eighteen pounds to the ton is required only fifty miles, and on the other half you descend by inertia. On the level road a pull of nine pounds to the ton is required for the entire distance, and thus the extent of exertion is equalized. It was not to be forgotten that they should have a regard to the power used. If the power to be used was that of animals, then it might happen that the hilly road would be better than the level; for nothing was better understood than that a dead and unvarying pull upon the same set of muscles would have the effect of causing the labour to be more severe, while a varying pull would alternately give quiescence and exercise to the muscles. If the line was so disposed as to throw the whole ascent in one spot, the advantage would be gained of having the rest of the road nearly level. But the cost of attaining this advantage should not be forgotten. Steeps of this description required an increased power, and the engines capable of working on the general line of road, would not be capable of exerting an increased force. There were only two ways of performing sudden ascents, one by the agency of an additional engine, and the other, by having the whole train pulled up by means of a rope. The additional engine would occasion much additional expense, for the hands supplying it would always be preserved, and the men should be paid their wages whether wanting or not. The use of the rope would occasion an enormous waste of power, and he would mention the instance of a place where an ascent of one foot to one hundred and six occurred. The rope had to be five miles long, and its weight was sixty thousand pounds. He next referred to one point, on which he seemed to consider that engines generally were at variance with what was correct. He contended that the heat of the fire is directly proportional to the quantity of the steam allowed to escape in a definite time into the flue, and consequently that half the number of blasts of steam projected into the chimney in an engine going up a hill, would have the same effect in exciting the fire as double the number of blasts of half the condensation, when the engine was running on a level plane. He would merely add one or two words on the effect of curves. The centrifugal force gives a tendency to fly from the centre, and the flange being pressed against the rails produces friction. The flange pressed out against the rails causes it to strike against them, and either the rails are injured, or the wheel goes over them. The learned lecturer, after adverting to the abrupt curve at the termination of the Kingstown railway, the radius being not more than half a mile, concluded by saying, that in any case it would be most essential to avoid having any curves at the termination of a descent.

Mr. Vignoles, in reply to Dr. Lardner's remarks on the curves and inclines on railways, and particularly as to the curve on the Dublin and Kingstown railway between Seapoint and Salt-hill, gave instances of curves of much shorter radius than the curve at Salt-hill having been travelled over at high velocities for several years without accident; and Mr. Vignoles trusted, the actual results of experience would relieve the apprehensions which the fair auditors of the discussion might entertain for their safety, when next they trusted themselves on the Kingstown railway. He mentioned the junction-curve from the St. Helen's railway, on to the Liverpool and Manchester railway, near the twelve-mile post, at the foot of the Sutton inclined plane, which had a radius of only 200 yards on a gradient of one in two hundred. The curve on the junctions of the North Union railway from Preston and Wigan, with the Liverpool and Manchester railway, near the seventeen-mile post on that line, not far from Parkside-bridge, where Mr. Huskisson was killed, was drawn with a radius of about 550 yards, and had a gradient of 1 in 377; and on this curve the railway trains had travelled daily for three years at high velocities, not only without accident, but without having sensibly put the rails out of guage; that is, that the original parallelism of the rails had not been materially or sensibly affected. He also mentioned—in opposition to Dr. Lardner's remark, that the climax of danger was to be apprehended from a curve immediately commenced at the foot of an inclined plane—that on the Runcorn-Gap railway, he had frequently ran down the self-acting plane with several waggons, without breaks, at the highest velocities, and without accident. The plane was graduated 1 in 36; and at the foot a curve begins with a radius very little more than the radius of the Salt-hill curve on the Dublin and Kingstown railway, and with a gradient of 1 in 330—and down this inclined plane the coal waggons continually ran without accident. He then proceeded to state that the curve near Salt-hill was described with a radius of about half a mile, or 880 yards, and was on a horizontal or dead level for the principal part of its length, and on a gradient of 1 in 400 for the remainder. He took occasion to remind Dr. Lardner, that it was extremely easy to counteract the effects of the centrifugal force acting on trains passing along curves at high velocities, by elevating the outer or convex side of the railway; and that the maximum or even the average velocity being assumed, and the radius of the curve, or rather (as Mr. Vignoles observed from a more correct expression furnished by Mr. Cubitt, to the Institution of Civil Engineers,) the radius of the curvilineal motion of the centre of gravity of the locomotive engine or load, being known, a very simple formula was obtainable, which gave the measure of the necessary elevation of the outer rail of the road above the inner rail, in order to counteract the effects of the centrifugal forces. He also produced a most interesting collection of papers on railways, embodied in the American Railroad Journal, a publication already extended to six respectable quarto volumes; and alluding to some great lines of projected railways through the States of New York, observed that the engineer of that work had rather prided himself on obtaining a route on which no elevation would be more than 100 feet in a mile (1 in 53), and no curve of a shorter radius than 100 yards. He concurred with Dr. Lardner, that it would be better that a railway should be straight and level, but he protested against the categorical conclusions of the learned professor, which, if strictly acted upon, would be prohibitory of many useful lines of railway in various countries. He then entered upon the question of the manner in which inclines should be introduced in railways, and contended from his own extensive experience, and from daily observations on the railways in operation, that the most desirable mode was to concentrate the steep inclinations, so that, by the help of an additional engine, the train might be got up with the same full load which the easier gradients on the other parts of the line would allow to be carried. He distinctly denied the assertion of Dr. Lardner, that whether the locomotive engines went at the rate of twenty or of ten, or even of five miles in an hour, the same quantity of steam was injected into the chimney in the same time, and thereby an equal draft created; for if Dr. Lardner's assertion were true, the steam pressure, which at the ordinary velocity of twenty miles an hour, was 50lbs. on the square inch of the piston above the atmospheric pressure, would have a pressure of 100lbs. per square inch when the velocity was reduced to ten miles an hour, and of 200lbs. per square inch when moving only at five miles an hour—which was a manifest absurdity.

DISTRESSING CIRCUMSTANCE.

At Plymouth, in 1766, a marine soldier was sentenced to be shot for desertion. The marine companies and the fourth regiment were ordered to attend the execution. The prisoner was led from the barracks, attended by a clergyman, and escorted by an officer's guard, the coffin *being carried before him. On his way to the field of* execution, which was about a quarter of a mile distant, the unfortunate culprit often knelt down and prayed most fervently. Having reached the field, he was ordered to march round the troops to admonish them, the clergyman dictating what he said; after which he went back to his place. Nine men, who were formerly deserters, were appointed to shoot him. He knelt, and was desired by the officer to pull the cap over his face, which he did; and whilst the officer turned round, the soldier dropped his handkerchief, which was understood by those who were to fire, as a *signal*; and before the officer could prevent them, their pieces were discharged, and the unfortunate man had fallen, pierced by three balls. The officer had a reprieve for him, and while turning to take it from his pocket, the catastrophe happened.

THE MAN IN THE MOON.

A LEGEND.

SIR—As I observe in a recent number of your Journal, an account of some philosophers *having ascertained* to a *certainty* that the moon is inhabited, I beg to send you a metrical description of the manner in which the first inhabitant was sent there—at least this is the version of the story given in my part of the country.

Duhallow. E. W.

Through optic glass when sages view
The moon's deep vales, her fountains blue,
Her every stream and ocean—
Alas! how vainly proud, they try
To cheat each honest, vulgar eye
With many a wild-goose notion!